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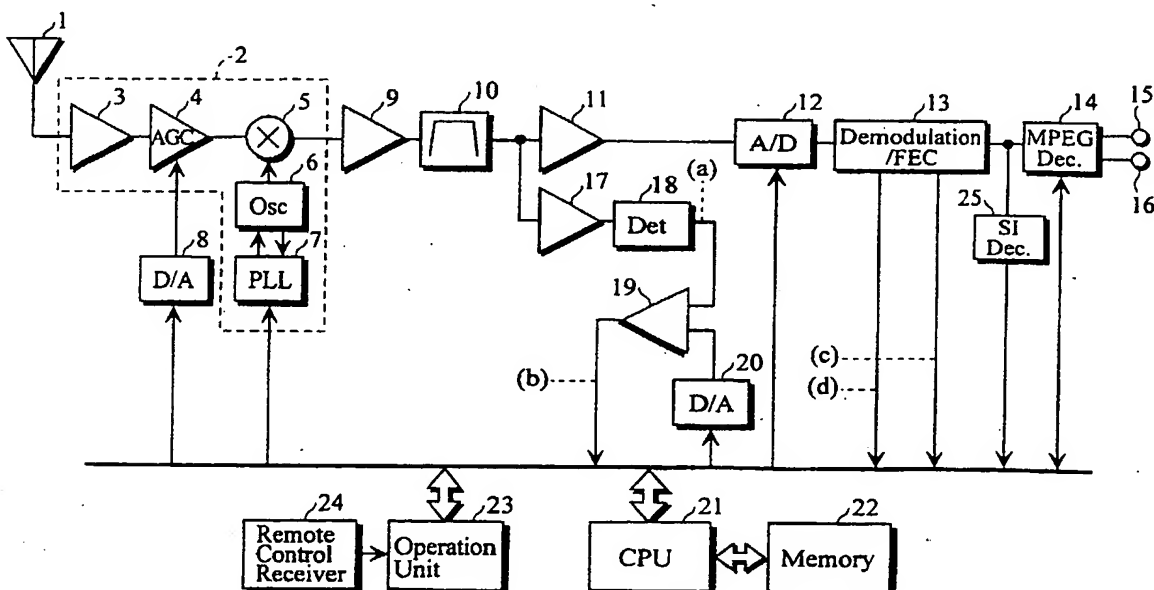
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(54) Abstract Title

A broadcast receiver with means for finding a set of channels that meet some quality criterion and then examining this set for further channel information

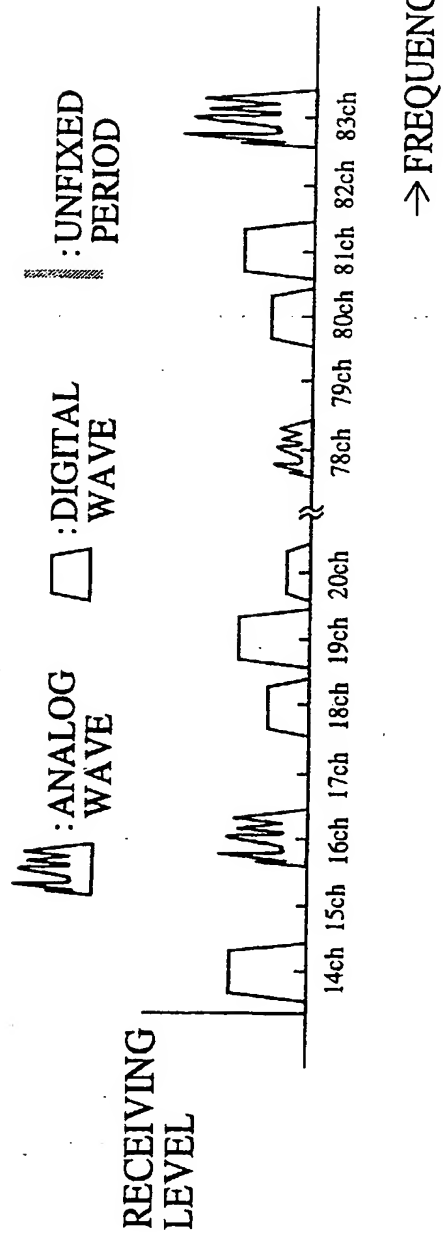
(57) A digital broadcasting receiver comprises first means (21, 4, 8, 19, 20, 7) for performing pre-scan processing for successively tuning in on channels previously set, to examine whether or not a received signal on each of the channels is of a predetermined quality or more, and temporarily registering the channel numbers of the channels on which the received signals are of the predetermined quality or more in a storage device (22) as receivable channel candidates, and second means (21, 4, 7, 13) for performing normal scan processing for successively tuning in on the receivable channel candidates temporarily registered in the storage device by the first means, to acquire and register necessary channel information.

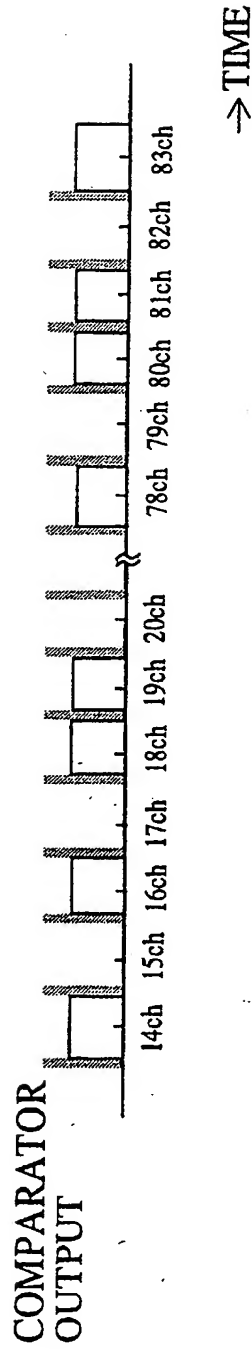
FIG. 1



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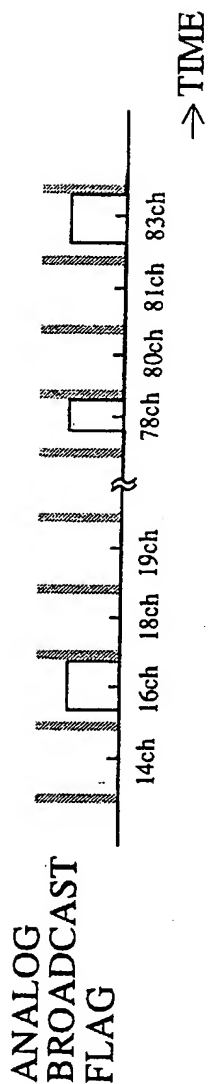
FIG. 2





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FIG. 6



SPECIFICATION

TITLE OF THE INVENTION

DIGITAL BROADCASTING RECEIVER AND CHANNEL INFORMATION
REGISTRATION PROCESSING METHOD IN DIGITAL BROADCASTING
RECEIVER

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a digital broadcasting receiver for receiving digital TV broadcasting and digital audio broadcasting, and a channel information registration processing method in the digital broadcasting receiver.

Description of the Prior Art

In conventional television broadcasting receivers, channel information such as a receivable channel number and service information have been registered in the receiver by making a channel scan (a search) for each channel. Conventionally, within a range of channels which can be received by a tuner, all the channels including the channel on which no programs are actually broadcast have been successively searched for the channel information.

In order to acquire the service information, it is necessary to wait until a demodulation/FEC (Forward Error Correction) circuit is

the first means, to acquire and register necessary channel information.

The pre-scan processing may be performed a plurality of number of times in the first means. It is preferable that the pre-scan processing is performed in a state where the gain of an automatic gain control amplifier in a tuner is fixed.

It is judged in the first means whether or not the received signal is of the predetermined quality or more on the basis of judgment whether or not received power is more than a predetermined value, for example.

Examples of the channel information include a receivable channel number, service information in the case of a channel in digital broadcasting, and a distinction between the channel in digital broadcasting and a channel in analog broadcasting.

A channel information registration processing method in a digital broadcasting receiver according to the present invention is characterized by comprising a first step of performing pre-scan processing for successively tuning in on channels previously set, to examine whether or not a received signal on each of the channels is of a predetermined quality or more, and temporarily registering the channel numbers of the channels on which the received signals are of the predetermined quality or more in a storage device as receivable channel candidates; and a second step of performing normal scan processing for successively tuning in on the receivable channel candidates temporarily registered in the storage device in the first

Fig. 4 is a timing chart showing a signal indicating whether or not a channel tuned in on is receivable;

Fig. 5 is a timing chart showing a demodulation locking signal indicating that a digital broadcast wave is normally received and demodulated;

Fig. 6 is a timing chart showing a flag indicating that a received signal is an analog broadcast wave; and

Fig. 7 is a flow chart showing the procedure for channel information registration processing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be described.

Fig. 1 illustrates the configuration of a digital broadcasting receiver.

In Fig. 1, reference numeral 1 denotes a receiving antenna. Reference numeral 2 denotes a tuner for tuning in on an RF (Radio Frequency) signal from the antenna 1 and converting the RF signal tuned in on into an IF (Intermediate Frequency) signal.

Reference numeral 3 denotes an initial-stage amplifier. Reference numeral 4 denotes an AGC (Automatic Gain Control) amplifier whose gain is variable by a control voltage from the exterior. Reference numeral 5 denotes a down converter for converting the received RF signal into an IF signal that is a difference frequency signal between a local frequency signal generated in a voltage controlled oscillator 6 and the received RF signal. Reference numeral

The demodulation/FEC circuit 13 outputs an analog broadcast wave flag (c) when it normally receives the analog broadcast wave.

Reference numeral 15 denotes a base band video signal output terminal. Reference numeral 16 denotes a base band audio signal output terminal. Reference numeral 18 denotes a detection circuit for detecting the IF signal outputted from the intermediate frequency amplifier 17. Reference numeral 19 denotes a comparator for comparing the level of the IF signal, which has been detected, obtained by the detection circuit 18 with a reference voltage in order to judge whether or not a channel tuned in on is receivable. Reference numeral 20 denotes a D/A converter for converting the data from the CPU 21 into a voltage to generate the reference voltage of the comparator 19.

Reference numeral 21 denotes a CPU. Reference numeral 22 denotes a memory. Reference numeral 23 denotes an operation unit operated by a viewer. Reference numeral 24 denotes a remote control receiver for receiving a signal from a remote control (not shown) and issuing a command to the operation unit 23. Reference numeral 25 denotes an SI (Service Information) decoder for demodulating service information multiplexed on each physical channel.

Fig. 2 illustrates an example of a receiving spectrum in a UHF (Ultrahigh Frequency)-TV band.

Fig. 3 illustrates a signal waveform (a voltage waveform of a signal (a)) after the detection in a case where a channel scan is made.

Fig. 4 illustrates a signal indicating whether or not a channel

reaches its maximum (step 1). Further, the CPU 21 feeds data to the D/A converter 20 in order to feed to the comparator 19 a reference voltage for judging whether or not a channel tuned in on is receivable (step 2).

Furthermore, the CPU 21 sets an initial value of the channel tuned in on (step 3). As the initial value, the minimum value in a channel range, that is, Channel 14 is set in the case of U.S. UHF. In order to tune in on the set channel, channel selection data is fed to the PLL circuit 7 (step 4).

A radio wave received in the antenna 1 is amplified by the initial-stage amplifier 3 in the tuner 2, is further amplified by the AGC amplifier 4 whose gain has been set to its maximum by an instruction from the CPU 21, and is then fed to the down converter 5. A local signal generated in the voltage controlled oscillator 6 is fed to the down converter 5.

An output signal of the down converter 5 is fed to the band pass filter 10 through the amplifier 9. An IF signal on a desired channel tuned in on is outputted from the band pass filter 10. The IF signal is amplified by the amplifier 17, and is then fed to the comparator 19 through the detection circuit 18. In the comparator 19, an output voltage of the detection circuit 18 and the reference voltage outputted from the D/A converter 20 are compared with each other in order to judge whether or not the channel tuned in on is receivable.

A high-level signal indicating that the channel tuned in on is receivable is outputted from the comparator 19 when the output

demodulation/FEC circuit 13. In the pre-scan processing, however, it is judged whether or not the channel tuned in on is receivable without examining the locking signal. In the pre-scan processing, a waveform as shown in Fig. 4 is obtained from the comparator 19.

The normal scan processing will be described.

In the normal scan processing, the CPU 21 releases the fixing of the gain of the AGC amplifier 4 (step 9). Consequently, the gain of the AGC amplifier 4 is controlled to the most suitable gain in conformity with the level of a received signal, as at the time of normal receiving.

The CPU 21 reads out one of the channel numbers of the receivable channel candidates which have been stored in the memory 22 by the pre-scan processing (step 10). In the examples shown in Figs. 3 and 4, Channels 14, 16, 18, 19, ..., 78, 80, 81, 83 are stored in the memory 22 as receivable channel candidates. Accordingly, Channel 14 is first read out.

The CPU 21 feeds data to the PLL circuit 7 in order to tune in on the channel whose channel number has been read out of the memory 22 (step 11). When the channel is tuned in on, an IF signal corresponding to the channel tuned in on is outputted from the tuner 2 and is converted into digital data by the A/D converter 12. The digital data is then fed to the demodulation/FEC circuit 13, where it is subjected to demodulation and error correction.

When the digital broadcast wave is normally received, as described above, the locking signal (d) is outputted from the demodulation/FEC circuit 13. When the analog broadcast wave is

step 10 and the subsequent steps is performed with respect to all the receivable channel candidates in the memory 22. When the processing in the step 10 and the subsequent steps is not performed with respect to all the receivable channel candidates in the memory 22, the channel number is updated to the channel number of the subsequent receivable channel candidate (step 19). Thereafter, the program is returned to the step 10.

When the processing in the step 10 and the subsequent steps is performed with respect to all the receivable channel candidates in the memory 22, the channel numbers of the receivable channel candidates which have been stored in the memory 22 in the pre-scan processing are erased (step 20). Thereafter, the normal scan processing is terminated.

Although in the above-mentioned embodiment, the pre-scan processing is performed only once, the pre-scan processing may be performed a plurality of times. When the pre-scan processing is performed a plurality of times, it can be judged whether or not a channel is a channel which is judged to be stably receivable or a channel, inferior in signal receiving quality, whose receiving level changes with time by fading or the like even if it is judged to be a receivable channel candidate. With respect to the channel inferior in signal receiving quality, it is possible to shorten the predetermined time period in the step 14 at the time of the normal scan processing.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way

WHAT IS CLAIMED

1. A digital broadcasting receiver comprising:

first means for performing pre-scan processing for successively tuning in on channels previously set, to examine whether or not a received signal on each of the channels is of a predetermined quality or more, and temporarily registering the channel numbers of the channels on which the received signals are of the predetermined quality or more in a storage device as receivable channel candidates; and

second means for performing normal scan processing for successively tuning in on the receivable channel candidates temporarily registered in the storage device by the first means, to acquire and register necessary channel information.

2. The digital broadcasting receiver according to claim 1, wherein

the pre-scan processing is performed a plurality of number of times in the first means.

3. The digital broadcasting receiver according to claim 1, wherein

the pre-scan processing is performed in a state where the gain of an automatic gain control amplifier in a tuner is fixed.

4. The digital broadcasting receiver according to claim 1, wherein it is judged in the first means whether or not the received signal is of the predetermined quality or more on the basis of judgment whether or not received power is more than a predetermined

the digital broadcasting receiver according to claim 6, wherein

the pre-scan processing in the first step is performed in a state where the gain of an automatic gain control amplifier in a tuner is fixed.

9. The channel information registration processing method in the digital broadcasting receiver according to claim 6, wherein it is judged in the first step whether or not the received signal is of the predetermined quality or more on the basis of judgment whether or not received power is more than a predetermined value.

10. The channel information registration processing method in the digital broadcasting receiver according to claim 6, wherein

the channel information include a receivable channel number, service information in the case of a channel in digital broadcasting, and a distinction between the channel in digital broadcasting and a channel in analog broadcasting.